

The Peat Bog Mollusc Fauna of Kecel-Császártöltés (County Bács-Kiskun in Hungary)

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Origin and characterization of the collecting area: the peat-bogs occurring in the county Bács-Kiskun developed from an immense moorland. This lowland marshy country begins in the precincts of the village Ócsa and extends with smaller or larger breaks, up to Bajaszentistván. The Kecel-Császártöltés peat-bogs are an important part of it. On the basis of the present examinations it is of an extend of 7,7 sq. km. The peat wealth of this area is of 11,5 million cu. m, i. e. 230 000 weight wagons. This quantity includes also the area between the railway line Kalocsa-Kiskörös and the Kalocsa main road, with an extension of 2,1 sq. km and with a peat quantity of 1,97 million cu. m, viz. 39 400 weight wagons. However it does not include the area in the precincts of the villages Császártöltés-Hajós with an extension of 0,8 sq. km and a peat quantity of 26.700 weight wagons.

The peat-bogs are extended to the precincts of villages Kiskörös-Akasztó-Izsák in the North, in the South to Sükösd-Érseksanád. While the Kiskörös-Akasztó areas form a coherent unit with the Kecel area, the Izsák, Sükösd, Érseksanád peat occurrences follow with greta breaks the areas lying southworth, respectively northworth of them. The reason of these breaks is the following: the peat formation is bound to pleistocenice sandbacks, because these mean natural waterfountains. Where these sandbacks had sank and their place occupied by alluvial blown-sand, there is no possibility to peat formation owing to the fact, that the sandhills of an incoherent composition, loose water easily. In the land between the sandhills are only bogs, the soil of which is full of the shells of marsh snails, to prove the former shallowness of water.

The length of the Akasztó-Kiskörös-Kecel-Császártöltés adjacent area is of round 25 km. It is in the Ne-Sw directio its middle section the most significant one in peat wealth—the Kecel area, is in N-S direction. Its width may be estimated 600 m. Examining the cross section, it can be sfated that the eastern perpendicular coast — which is yellow sand at the lower end, loess sand at the upper end — is peat, i. e. it fol-

lows its formation limits. The peat layers lying deepest in the layer are to be found in general along the line of the dredging pit, which becomes narrower towards the western end. The average peat thickness of the Kecel area is of 2—2,1 m. The layer sections made from the Kecel area show a characteristic riverbed section, the characteristic formation of the two banks may be found in it, as well as the traces of island formation. The peat layer becomes thin towards the western shore within a comparatively short distance. Thus it may be supposed that the formation of peat was not considerable beyond the limits of the river existing then.

The origin of the Kecel peat deposit at the southern part of the moorland called the "Red Morass", is to be attributed undoubtedly to the change of the Danube river-bed. The Danube river-bed lied most probably along the Soroksár-Ócsa-Sári-Kiskőrös-Császártöltés-Baja line and occupied the present river-bed during the holocen period. North to Császártöltés it is easy to state a row of hills which formed the eastern shores of the Danube at that time, as well as the river-beds of each tributary river flowing into the Danube then existing. After the change of the river-bed vegetation become abundant in the remaining dead Danube branch. The dying vegetation became peaty and sank under the water. The main peat formers are: *Carex*, *Schoenoplectus*, *Phragmites*, together with many equiseti.

No discovery came to light from the marshy land which could state with certitude the age of the peat deposit. Up to now only a head of urus found in 1951 is known, its age is about 2—3000 years. The process ceased completely, when draining the "Red Morass" in 1929. Since that time marshy land is sentenced to desolation, because the oxidation of the peat layers lying above the subsoil water level destroy the organic substance. The annihilation may be estimated in the Kecel marshy land to about yearly 90.000 tonns besides a 2—3 cm thich diminution of the peat layer.

The formation of the layers of the peat deposit is as follows: surface can be found already in many cases at the ground level. But it is characteristic in generally, that the peat is transversed by the borings under the thin earth layer which covers the peat. Mud and muddy peat can be found between the surface layer — which is generally grey material, sand — and the peag layer. This exceeds in some places also the thickness of the peat. The underneath layer of the peat deposit is a dark mature peat. A 50—100 cm thick, partly mixed peat layer of fibrous construction is to be found above this on many places, which is again covered with mature peat. Its avarage content of humus is 16% (besides 30% moistness).

The chemical analysis of the ash of the examined peat is as follows:

$\text{SiO}_2 = 52,9\%$, $\text{Fe}_2\text{O}_3 = 5,7\%$, $\text{Al}_2\text{O}_3 = 11,3\%$, $\text{CaO} = 19,4\%$, $\text{MgO} = 3,8\%$, $\text{SO}_3 = 2,9\%$, other = $4,0\%$. SiO_2 is generally the highest value, but that of CaO is also considerable. In some places the iron volume is also very high, it can even reach 48% . Meadowironore containing Fe_2O_3 can be found too, although in nests of very small extension. However vivanite occurs too, the average phosphorus contents of the peat is still low, in air-dry condition $0,69\%$. Similarly low is the calcium contents $0,08\%$. The chemical effect of the peat is neutral, i.e. faintly lixivious ($\text{pH} = 7,5$), its average humin material contents is 41% .

To save the continually decreasing peat wealth, the peat deposit is exploited by machines.

We continued our malacological examinations on the section between Kecel and Császártöltés, from the peat deposit in the length of about 4 km and in the width of about $1/2$ km. The Örvég canal belonged also to our examinations. The draining ditches crossing the peat deposit, their banks, the damppochy, swampy areas with rich vegetation, which arose from the pourings of the ditches and the peat exploited.

The methods of collecting were very divergent: we collected the fossil species together with the loose loess soil, which was then separated by sifting. We gathered the water species by casting a net, by a paring knife, while the Molluscs of the shore sections were partly gathered one by one, partly separated after the collection of vegetable fragments and moss-pillows. We registered the exact quantity of the species found, to state their frequency. We took in addition great care to store the material coming from the same biotops into special collecting pots. Finally we divided into two equal parts the material worked up, deposited them into our collection, mentioning the data of collecting.

We express our gratitude hereby too to Mr. Ernő Veress, Director of the Institute for Research of the Ministry of Light Industry and to dr. Andor Horváth for their valuable help partly in the characterisation of the peat deposit, partly in the control of the species determined.

As to the nomenclature we have to notice, that in the specification of the families and species Soós, L.: Mollusca (Fauna Hungariae, 19. Vol.) showed the way.

Lamellibranchia

Fam. Sphaeriidae

Pisidium amnicum O. F. Müll.—We found the fossil specimens of the family on loess soil. 17 pieces.

Gastropoda

Fam. Viviparidae

Viviparus connectus Millet.—42 pieces. Living specimens as well as half fossile ones came to light in a great quantity from in whole territory of the peat deposit.

Viviparus hungaricus H a z a y.—4 pieces. Of much rarer occurrence than the species before.

Fam. Valvatidae

Valvata cristata O. F. M ü l l.—36 pieces. Its half fossile specimens can be collected in great number from the soil of molehills, and from loess soil.

Fam. Hydrobiidae

Bithynia tentaculata L.—1 piece. From loess only 1 fossile specimen. This species is very seldom on the peat deposit, inspite of our detailed collections we could find only one specimen. We have to notice that on the course of our collecting in the southern part of the Hungarian Plain (Békéscsaba, Gyula) no recent specimen came to light, but it is frequent in the environs of the town Baja. It seems to be very rare in certain parts of the plain, or it is missing even on those territories, which would be otherwise adequate, to the conditions of life other species. Presumably the pH of water and soil may play a very important role in the spreading out of the species.

Fam. Ellobiidae

Carychium minimum O. F. M ü l l.—80 pieces. One part of the specimens is recent, the other one fossile. The recent specimens came to light from plantfragments saturated with water (sedge, reed, moss along the ditchbank and from torne out roots, the fossile specimens from loess. It appears frequently on the whole territory of the marshy land, where the conditions are adequate.

Fam. Limnaeidae

Galba truncatula O. F. M ü l l.—3 fresh shells from the shore of the Örvég canal, from muddy soil.

Stagnicola palustris f. *classiniana* H a z.—6 pieces. The type form does not occur on this territory, only this biological form of fossile condition. Its formation is probably one to the special conditions of life.

Limnaea stagnalis L.—28 pieces. It is a frequent species.

Radix ovata Drap.—87 living specimens sticking to a peatbrick which fell into the water of the canal flowing through the territory of the peat bog. We made interesting observations in connection to the Császártöltés appearance of the species. The bricket fallen into the ditch created a little water fall, which produced from the falling water bubbles a spot reach in oxygen. The snails of the species mentioned can be found in this water full of oxygen, settled on the peat brick in very leigh quantity, however on the other part of the ditch they appear only very scattered.

Fam. Physidae

Physa acuta Drap.—Its appearance agrees completely with that of the former species, we found them together on the peat brick fallen into the water, but in a much smaller number (52 ps.). We must not forget, that the *Physa acuta* species occuring here are smaller than the measures given by literature (height: 9,8, width : 5,9 mm).

Fam. Planorbidae

Planorbarius corneus L.—74 pcs. They are very common in the form of living and empty, fresh shells on the territory of the whole peat bog.

Planorbis planorbis L.—Its conditions of appearance are in every respect similar to those of the *Planorbarius corneus*. 56 pcs.

Planorbis vortex L.—3 pcs. fresh, empty shells from humid vegetable decay on a ditchbank.

Planorbis spirorbis L.—It is remarkable that this species of great oecological toleration which can be said common in different waters and very rare in Császártöltés. In spite of our detailed examinations we could find only 6 pieces of it, from the bottom of ditches, from mud.

Bathymphalus contortus L.—28 pieces fresh, empty shells from the humid vegetable decay on a ditchbank. It is not seldom on the territory of the peat deposit. A rather great amovnt of deformed exemplars came to light, belonging to this species.

Gyraulus albus O. F. Müll.—Similarly to the *Pisidium amnicum* only half-fossile specimens can be found from the loess near the peat deposit. 4 pcs.

Segmentina nitida O. F. Müll.—24 pcs. from the wet-watery territory, caught with a net from among water plants.

Segmentina complanata Drap.—4 pcs. also from standing water rich in plants. It appears together with the former species but in smaller quantity. According to literature this species is rare in Hungary.

As it came to light also during our collections performed on other territories (Somogy-Csurgó, Baja, Olcsvaapáti) from standing or slowly flowing waters rich in plants, usually it occurs in the company of *Segmentina nitida*. The supposition that it is much more frequent, seems right and the data of literature refering hereto must be revised in some respects.

Fam. Ancyliidae

Acroloxus lacustris L.—3 pcs. on the leaves of reed and sedge bending into the water.

Fam. Succineidae

Succinea oblonga Drap.—We found 16 pieces half-fossil specimens on the loess territories near the peat-bog. Striking formal variations can be observed among the species.

Succinea putris L.—4 pcs. on a ditch shore, in the decay. This species seems to be rare on the bog territories.

Succinea Pfeifferi Rossm.—2 pcs. fresh shells also in the wet decay which was accumulated on a ditch shore, 2 pcs. half-fossil shell remains on loess soil.

Fam. Cochlicopidae

Cochlicopa lubrica O. F. Müll.—It appears in mass on wet-watery territories on the whole peatbog, and can be found in loess too. 128 pieces.

Fam. Pupillidae

Vertigo angustior Jeffr.—24 pcs. on wet-watery territories, 100 pieces sifted from the surface layers of loess. The most frequent *Vertigo* species.

Vertigo moulinsiana Dupuy.—4 pcs. living specimens from the wet plant decay near the canal flowing through the peat deposit. Literature knows this species up to this time only from the Bátorliget fauna, from Jászó and Nádaska and its Császártöltés appearance proves that we have to count with its broader extension. It could have been the characteristic snail of the former boggy territories of the Plain but it is sentenced to death with the cessation of the bogs and can live its last days on these territories.

Vertigo pygmaea Drap.—It is rather frequent on wet watery territories and in loess. Altogether 50 pcs.

Vertigo antivergo D r a p.—Also on wet watery territories and in loess. 30 pcs. The big species-number of the *Vertigo* species is surprising on the peat bog. The circumstances of life are — apparently — especially favourable for the vertigos, because every species described on the plain — and hillterritories came to light.

Pupilla muscorum L. 668 pieces. The living as well as the dead specimens are very frequent on the ditchshore and in loess. We can say that it is the most frequent snail of the peat-bog. Conspicuous variations in size occur among the specimens of the species. (f. *elongata* Cless.?)

Fam. Valloniidae

Vallonia pulchella O. F. Müll.— 18 pieces from the loess soil extending near the peat deposit.

Vallonia enniensis Gredl.—42 pieces from near a ditchshore, 244 pieces from loess. Our collecting experiences made up to now, showed that in plain country *Vallonia pulchella* is dominating, the *Vallonia enniensis* and the *Vallonia costata* is more characteristic for hilly and mountaneous countries. But here we found *Vallonia costata* missing and *Vallonia pulchella* appearing in a conspicuously small species number, related to *Vallonia enniensis*.

Fam. Enidae

Imparietula tridens O. F. Müll.—16 pieces from loess. We could not find any living specimen, although it is imaginable that it lives on the peripheral parts of the marshy land, in xerotherm milieu.

Fam. Zonitidae

Zonitoides nitidus O. F. Müll.—60 pieces on ditch shores, in wet, watery places. It is frequent among suitable surrounding conditions.

Vitrea crystallina O. F. Müll.—3 pieces on the field lying near the peat deposit, in loess-soil. It is rare on the collecting territory.

Euconulus fulvus M o n t.—3 pieces in the wet decay along the ditch shore. A rare species too.

Fam. Fruticolidae

Fruticicola fruticum O. F. Müll.—3 pieces in the loess lying besides the peat-bog. It is not living anymore on the territory of the bog, at least its recent specimen could not be found, in spite of intensive teaching.

Helicella obvia Hartm.—20 pieces from the grass-grown, bushy territory lying on the edge of the peat-bog.

Monacha carthusiana O. F. Müll.—On the grass-grown, bushy xerotherm parts of Császártöltés. Its appearance is scattered. 8 pieces.

Monachoides rubiginosa A. Schmidt.—16 pieces on the side of a ditch shore among moss leaves.

Cepaea vindobonensis C. Pfeiffer—8 pieces on the xerotherm parts of the peat deposit. Its appearance agrees with those of *Helicella obvia* and *Monacha carthusiana*.

As a result of our gathering 1 family of Lamellibranchia class was found in 17 species number, and 39 species from 15 families of the Gastropoda class in totally 2534 species-number.

Ecological valuation

The molluscan species appearing on the territory of the peatbog can be classified in to two large groups, namely into the group of fossile and recent species. Within these the species are divided as follows:

I. Fossile species. The species mentioned below were found by single gathering or sifting from the surface layer (5—10 cm) of the loess soil, near the peat bog as well as from the peat brought to the surface by the dragging machines (16 species; 40%): *Pisidium amnicum*, *Valvata cristata*, *Bithynia tentaculata*, *Carychium minimum*, *Stagnicola palustris* f. *clessiniana*, *Gyraulus albus*, *Succinea oblonga*, *Vertigo angustior*, *Vertigo pygmaea*, *Vertigo antivertigo*, *Pupilla muscorum*, *Vallonia pulchella*, *Vallonia enniensis*, *Imparietula tridens*, *Vitrea cristallina*, *Fruticicola fruticum*. One part of the enumerated species can be found in recent condition too. The fossilias are also swamp- and boginhabitants without exception, we have therefore every reason to suppose, that the fauna which had already taken shape before human interference (draining, production of peat) could have flourished in its wholeness on this territory. We discuss them therefore in this paper together with the recent ones.

II. Recent species. As the peat deposit is already a drained territory today, exploitation going on also at present, so it lost the character as natural region, it still had before some decades as well as its flora and fauna. Its molluscan fauna also reduced considerably. This statement is to be proved by the fact that the species found are fossile or half-fossile already. The development of coenoses becomes only possible in the ditches which flow across the territory of former bog, and serve for its draining, respectively in the 2—3 m stripe near their

shore, furthermore on the wet-watery parts coming from the inundation of the ditches, because here they are able to found the oecological conditions imperatively necessary for their lives (water, waterplantation, wet and decaying vegetal rubbish). According to this the following units of surroundings are discernable: 1. bed of ditches, 2. shore of ditches, 3. wet-watery territories rich in plants which owe their existence to the inundations of ditches, 4. drier, grass-grown territories.

1. Bed of ditches. At the general characterisation of the collecting area we already wrote about this part of the territory. Here we want to mention only that the ditches are cut in the peatsoil, are sufficiently rich in water and well supplied with oxygen, their running is not fast, their water is acidic. Water plants settled in them on some places. The species which can be found here are living partly in the free water, partly on the bottom (in the mud), partly among the water plants.

The following species were found swimming in the free water and temporarily settled on water plants: *Viviparus contectus*, *Viviparus hungaricus*, *Limnaea stagnalis*, *Planorbarius corneus* and *Planorbis planorbis*. In the mud of the bottom, respectively on a peatbrick which had fallen into the water, *Radix ovata*, *Physa acuta*, *Planorbis spirorbis* are living. On the leaves bending into the water of the shore vegetation *Acroloxus lacustris* is settling. The number of species living in the water is 9 (22,5%).

2. The shore of ditches. On the plants of ditchshores, mainly on the leaves of sedge and reed, *Succinea putris* and *Succinea pfeifferi* can be found. On the muddy soil soaked with water *Galba truncatula* is not rare. The decay accumulated at the bottom of water plants and on the moss pillows secure optimal conditions for many species of molluscas, as a result the specimen and species number of the molluscas is considerable: *Carychium minimum*, *Planorbis vortex*, *Bathyomphalus contortus*, *Cochlicopa lubrica*, *Vertigo angustior*, *Vertigo moulinsiana*, *Vertigo pygmaea*, *Vertigo antivertigo*, *Pupilla muscorum*, *Vallonia enniensis*, *Zonitoides nitidus*, *Euconulus fulvus* and *Monachoides rubiginosa* are frequent. Among the roots of the plants torn out of the soil *Carychium* and *Vertigo* species are hiding. 16 (40%) of the species occur on the shore of the dit.

3. The wet-watery territories, rich in vegetation, deriving from the inundations of the ditches. This surrounding unit is fairly similar to that of the ditchshores. The circumstance that on one hand there are species which are found to live only here, on the other hand that some, mainly amphibic species are absent, just because of the higher contents of water, made it necessary to classify this territory into separate oecological group. *Viviparus contectus*, *Limnaea stagnalis*, *Planorbarius corneus*, *Planorbis planorbis*, *Segmentina complanata* and *Segmen-*

tina nitida are living in puddles 15—20 cm deep. *Cochlicopa lubrica*, *Vertigo angustior*, *Vertigo antivertigo*, *Zonitoides nitidus* and *Monachoides rubiginosa* are the characteristic species of the wet-watery parts. The amount of the species found is 11 (27,5%).

4. Drier, grass-grown territories. The amount of species loving the expressly xerotherm conditions is small. According to our opinion they do not belonging closely to the mollusc-fauna of the bog, grass-grown, bushy land-sections were developed and thus good living possibilities arose for the xerophil species. The following species were found in the periphery of the peat deposit, partly from among the dry fallen leaves and parched grass, partly from the bushes: *Imparietula tridens*, *Helicella obvia*, *Monacha carthusiana* and *Cepaea vindobonensis*, 4 species (10%).

Finally we can state that 90% of the species which can be found on the peat bog are requiring watery, respectively wet territories, and 10% of them land. The number of aquatic species needing wetness is reduced, as a consequence of human intervention: 9 such species of fossile condition were found, which do either not live anymore, or are of very rare occurrence on the bog (22,50% of the species found totally). The species loose their surrounding conditions owing to the exploitation of peat and by to drainage which lead to the further reduction and finally to the extinction of the whole recent fauna.

Faunagenetical valuation

1. Members of the ancient stock (37,5%): *Pisidium amnicum*, *Bithynia tentaculata*, *Carychium minimum*, *Limnaea stagnalis*, *Stagnicola palustris* f. *clessiniana*, *Planorbartius corneus*, *Planorbis planorbis*, *Gyraulus albus*, *Planorbis vortex*, *Pupilla muscorum*, *Vertigo angustior*, *Vallonia pulchella*, *Succinea Pfeifferi*, *Segmentina nitida*, *Vitrea crystallina*.

2. Middle-European elements of fauna (37,5%): *Viviparus connectus*, *Valvata cristata*, *Radix ovata*, *Galba truncatula*, *Planorbis spirorbis*, *Bathymphalus contortus*, *Segmentina complanata*, *Acroloxus lacustris*, *Succinea putris*, *Succinea oblonga*, *Cochlicopa lubrica*, *Vertigo pygmaea*, *Vertigo antivertigo*, *Zonitoides nitidus*, *Euconulus fulvus*.

3. Mediterranean elements (7,5%): *Physa acuta*, *Vertigo moulinsiana*, *Vallonia enniensis*.

4. Moesian elements (12,5%): *Imparietula tridens*, *Fruticicola fruticum*, *Helicella obvia*, *Monacha carthusiana*, *Cepaea vindobonensis*.

5. East-European element (2,5%): *Monachoides rubiginosa*.

6. The endemic element of the central basin (2,5%): *Viviparus hungaricus*.

The elements of the ancient stock and the Middle-European elements form the majority of the fauna (72,5%), after them the Moesian species show the largest percentage. In case we are examining the Moesian-elements occurring here, which show a striking proportion, we can see that these can be found on the whole territory of the country among suitable surrounding conditions. The same can be stated of the single East-European and endemic element too. The situation is more interesting at the Mediterranean species. *Physa acuta* which was indicated from some spreaded spots of the country, was found in many places during the course of our own collecting work too (Somogy-Csurgó, Császártöltés, Hódmezővásárhely, Békéscsaba, Gyula), it can be presumed that we have to count with its much larger occurrence, extending almost to the whole territory of the country, although it got to us by dragging in. Some formal modifications can be shown at this species according to the characteristics of collecting place (e.g. Császártöltés specimens are much smaller, slimmer than those of Hódmezővásárhely and Békéscsaba). The occurrence of *Vertigo moulinsiana* is surprising because up to now we were only aware of its appearance in Bátorliget, Jászó, Nádaska. It is most probably the characteristic species of the peatbogs, respectively of the enumeration. It is problematical and needs further examinations, whether it can be found else where on similar territories of the country. The incompleteness of data can be related to the cessation of the moorlands.

Summary

The Kecel-Császártöltés peat-deposit is the most important part of the peat territory extending from Ócsa to Bajszentistván. Its mollusc-fauna was unexplored up to the present. We performed our examinations in the surroundings of the canal Örvég, in 4 km length and in 1/2 km width 1st sketch of page 4 between the villages Kecel and Császártöltés. Collecting resulted 2551 specimens belonging to 40 species of 16 families. The fossils have a share of 16 species, which make out 40% of all species. The ecological distribution of the territory, with the number and the percentage of the species found, is the following: 1. ditch-bead 9 species (22,5%), 2. ditch-shore 16 species (40%), 3. wet-watery territories deriving from overflowings of ditches 11 species (27,5%), 4. drier grass-grown territories 4 species (10%). 90% of the fauna is aquatic or frequents wet territories, 10% of it lives on dry land. Comparison of the amount of the fossile and recent species shows that the human interference (draining, peatexploitation) results the diminution of the fauna.

The distribution of the elements of the fauna: members of the ancient stock 15 species (37,5%), Middle-European elements 15 species (37,5%), elements of southern connection 3 species (7,5%), Moesian elements 5 species (12,5%), East-European element 1 species (2,5%). The majority of the fauna is given by the ancient stock and the Middle-European elements (75%), the proportion of the Moesian invasion is also worth mentioning. Its endemicity is very small, only *Viviparus hungaricus* can be found, which occurs also on other plain territories of the country.

LITERATURE

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Summary

The Mollusca fauna of the post-deposit is the most numerous recorded from Ócsa to Budapest. The fauna was related to the present *W. stagnorum* in the surroundings of the canal. In 1951 within 1st sketch of post-deposit (Mollusca) following results were obtained. The faunas have a common character. The species *W. stagnorum* with the highest and the percentage of the fauna. The ditch-bed is a low-water territory and the grassy area is a high-water territory. The ditch-bed is a low-water territory and the grassy area is a high-water territory.